SMART PRODUCT PRICING SOLUTION

PRESENTED BY TEAM:
ECOCODER

Problem Statement

- Accurate product pricing is vital to maximize revenue, improve conversion, and reduce inventory waste.
- **Goal:** Predict optimal product price using text and image data.
- **ML Type:** Supervised regression.
- **Input:** Catalog text, image, product quantity.
- **Target:** Price (continuous value).
- **Success Metric:** Low SMAPE (Symmetric Mean Absolute Percentage Error).

Data Description & Cleaning

Dataset: sample_id, catalog_content, image_link, price (train).

Preprocessing Steps:

- Validate & download images (skip broken links).
- Clean text: lowercase, remove HTML/punctuation, extract numeric info (e.g., "2 pack", "500ml").
- Handle missing data (text-only fallback).
- Normalize & resize images.

Feature Engineering

Textual Features:

- Sentence Transformer / BERT embeddings.
- TF-IDF / n-grams / numeric token features.

Visual Features:

- CNN backbone (ResNet / EfficientNet).
- Extract visual embeddings.

Combined Features:

- Concatenate text + image embeddings.
- Add metadata (word count, brand presence, description length).

Model Architecture & Training

Models:

- Baselines: Linear, Ridge, XGBoost, LightGBM.
- Final: Multimodal Neural Network.

Pipeline: Text encoder → Image encoder → Fusion head → Dense layers → Price output.

Training Setup:

- Split: Train/validation or k-fold.
- Loss: MSE / MAE; Evaluate via SMAPE.
- Techniques: Early stopping, LR decay, checkpointing, ensemble averaging.

Experiments & Limitations

Analysis:

- Ablation tests (text/image/IPQ).
- Ensemble improved performance.

Risks:

- Outliers affecting loss.
- Low-quality/missing images.
- Domain shift on unseen categories.
- Overfitting and model size constraints.

Results & Conclusion

- Developed multimodal price prediction model using text + image + numeric features.
- Ensemble model achieved lowest SMAPE.
- Confirmed importance of all modalities.
- Addressed missing data, outliers, domain shift.